7. REGULATIONS AND ADVISORIES

The international, national, and state regulations and guidelines regarding α-, β-, γ-, and δ-HCH in air, water, and other media are summarized in Table 7-1. Unless otherwise specified, the regulations in the table refer to HCH in general (all isomers).

EPA (IRIS 1998) assigned γ-HCH an oral reference dose (RfD) of 3.00×10^{-4} mg/kg/day with an uncertainty factor of 1,000 based on liver and kidney toxicity in rats (Zoecon Corporation 1983).

EPA (IRIS 1998) has assigned the following weight-of-evidence classifications: α-HCH is assigned a classification of B2 (probable human carcinogen); β-HCH is assigned a classification of C (possible human carcinogen); γ-HCH is among those substances being evaluated by the EPA for evidence of human carcinogenicity; and δ-HCH is assigned a classification of D (not classifiable as to human carcinogenicity).

EPA estimates that concentrations of α-HCH in water of 0.6, 0.06, and 0.006 µg/L are associated in humans with excess lifetime cancer risks of 10^{-4}, 10^{-5}, and 10^{-6}, respectively, and that concentrations of β-HCH in water of 2, 0.2, and 0.02, µg/L are associated in humans with excess lifetime cancer risks of 10^{-4}, 10^{-5}, and 10^{-6}, respectively (IRIS 1998).

γ-HCH is on the list of chemicals appearing in "Toxic Chemicals Subject to Section 313 of the Emergency Planning and Right-to-Know Act of 1986" (EPA 1991h, 1988f).

Tolerances are established for γ-HCH in or on raw agricultural commodities as follows: 7 ppm in or on the fat of meat from cattle, goats, horses, and sheep; 4 ppm in or on the fat of meat from hogs; 3 ppm in or on cucumbers, lettuce, melons, pumpkin, squash, summer squash, and tomatoes; and 1 ppm in or on apples and apricots (EPA 1974a, 1974b).

The use of γ-HCH has been restricted by EPA since 1977 and is to be applied only by a certified applicator (EPA 1985b).

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane

Agency	Description	Information	References
INTERNATIONAL			
FAO/WHO	ADI 0.0–0.1 mg/kg	WHO 1976; FAO/ body weight	WHO 1978
	Allowable tolerances (γ-HCH)		WHO 1976
	Potatoes	0.05 mg/kg	
	Lettuce	2.0 mg/kg	
IARC	Carcinogenic classification	Group 2B[a]	IARC 1987
WHO	Guidelines for drinking water	0.003 mg/L	WHO 1984
NATIONAL			
Regulations:			
a. Air: OSHA	PEL TWA (skin designation)(γ-HCH)	0.5 mg/m^3	OSHA 1998 (29 CFR 1910.1000); OSHA 1989b
	Meets criteria for OSHA medical records rule (α-HCH, γ-HCH)	Yes	OSHA 1987 (29 CFR 1910.20); OSHA 1988
b. Water: EPA ODW	Regulated under the SDWA of 1986; drinking water quality standard (γ-HCH)	4 µg/L	FSTRAC 1990
EPA OWRS	General pretreatment regulations for existing and new sources of pollution	Yes	EPA 1988b (40 CFR 403, Appendix B); EPA 1988c
c. Food: FDA	Permissible levels in bottled water	0.004 mg/L	FDA 1989a (21 CFR 103.35); FDA 1982b
EPA	Tolerance for residues (γ-HCH):		EPA 1998 (40 CFR 180.133)
	in or on the fat of meat from cattle, goats, horses,and sheep	7 mg/kg	
	in or on the fat of meat from hogs	4 mg/kg	
	in or on cucumbers, lettuce, melons, mushrooms, pumpkin, squash, summer squash, and tomatoes	3 mg/kg	
	in or on apples, apricots, asparagus, avocados, broccoli, brussel sprouts, cabbage, cauliflower, celery, cherries, collards, eggplants, grapes, gauvas, kale, kohlrabi, mangoes, mustard greens, nectarines, okra, onions (dry bulb only), peaches, pears, peppers, pineapples, plums (fresh prunes), quinces, spinach, strawberries, and Swiss chard	1 mg/kg	
	in or on pecans	0.01 mg/kg	
d. Other: DOT	Hazardous Material Transportation Act: γ-HCH is designated as a hazardous materials which is subject to requirements for packaging, shipping and transporting.	Yes	DOT 1989a (49 CFR 172.101, Appendix A); DOT 1989b

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
NATIONAL (Cont.)			
EPA OERR	Reportable quantity (γ-HCH)	1 pound	EPA 1996a (40 CFR 302.4); EPA 1998
	Extremely hazardous substances Threshold Planning Quantity (γ-HCH)	1,000/10,000 pounds	EPA 1996b (40 CFR 355, Appendix A); EPA 1998
EPA OSW	Designated as a hazardous substance (γ-HCH)	Yes	EPA 1996c (40 CFR 302.4); EPA 1998
	Designated as a hazardous pollutant under section 311(b)(2)(A) of the Federal Water Pollution Control Act (γ-HCH)	Yes	EPA 1996d (40 CFR 116.4); EPA 1998
	Designated as a toxic pollutant under Section 307(a)(1) of the Federal Water Pollution Act (γ-HCH)	Yes	EPA 1996e (40 CFR 401.15); EPA 1979b
	Groundwater monitoring requirement (γ-HCH)/Maximum concentration	Yes/0.004 mg/L	EPA 1987e (40 CFR 264.94); EPA 1987f
	Listing as a hazardous waste; discarded commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products (γ-HCH)	No	EPA 1996f (40 CFR 261.33); EPA 1998
	Listing as a hazardous constituent (γ-HCH)	Yes	EPA 1998(40 CFR 261, Appendix VIII); EPA 1998
	Maximum concentration of contaminants for the toxicity characteristic (γ-HCH)	0.4 mg/L	EPA 1998(40 CFR 261.24); EPA 1990d
EPA OTS	Toxic release reporting; Community Right-to-Know (γ-HCH)	Yes	EPA 1998 (40 CFR 372)
Guidelines:			
a. Air:			
ACGIH	TLV TWA (skin designation) (γ-HCH)	0.5 mg/m^3	ACGIH 1998
NIOSH	REL TWA (skin designation) (γ-HCH)	0.5 mg/m^3	NIOSH 1998
b. Water:			
EPA ODW	MCL in drinking water (γ-HCH)	0.0002 mg/L	EPA 1996
	MCLG in drinking water (γ-HCH)	0.0002 mg/L	
	Health advisories (γ-HCH)		
	1-day	1.0 mg/L	
	10-day	1.0 mg/L	
	Longer term (child)	0.03 mg/L	
	Longer term (adult)	0.1 mg/L	

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
NATIONAL (Cont.)			
	Lifetime	0.2×10^{-4} mg/L	
	RfD	3.0×10^{-4} mg/L	
	DWEL	0.01 mg/L	
EPA OWRS	Ambient water quality criteria for protection of human health:		EPA 1996j (40 CFR 130)
	Ingesting water and organisms		
	α-HCH	3.9×10^{-3} µg/L	
	β-HCH	1.4×10^{-2} µg/L	
	γ-HCH	1.9×10^{-2} µg/L	
	Ingesting of organisms only		
	α-HCH	1.3×10^{-2} µg/L	
	β-HCH	4.6×10^{-2} µg/L	
	γ-HCH	6.3×10^{-2} µg/L	
	Ambient water quality criteria for protection of aquatic life:		
	freshwater (γ-HCH)		
	acute	2.0 µg/L	
	chronic	8.0×10^{-2} µg/L	
	saltwater (γ-HCH)		
	acute	1.6×10^{-1} µg/L	
NAS	SNARL	(γ-HCH)	NAS 1982
	7 day	0.5 mg/L	
	24 hours	3.5 mg/L	
c. Other EPA			IRIS 1998
	α-HCH		
	Carcinogenic classification	Group B2[b]	
	Unit risk (air)	1.8×10^{-3} $(\mu g/m^3)^{-1}$	
	Unit risk (water)	1.8×10^{-4} $(\mu g/L)^{-1}$	
	β-HCH		
	Carcinogenic classification	Group C[c]	
	Unit risk (air)	5.3×10^{-4} $(\mu g/m^3)^{-1}$	
	Unit risk (water)	5.3×10^{-5} $(\mu g/L)^{-1}$	
	δ-HCH		
	Carcinogenic classification	Group D[d]	
	γ-HCH		
	RfD (oral)	3.00×10^{-4} (mg/kg/day)$^{-1}$	
	Carcinogenic classification	Under review	
	Technical-HCH		
	Carcinogenic classification	B2[b]	
	Unit risk (air)	5.1×10^{-4} $(\mu g/m^3)^{-1}$	
	Unit risk (water)	5.1×10^{-5} $(\mu g/L)^{-1}$	
NTP	α-HCH, β-HCH, γ-HCH, technical grade	Reasonably anticipated to be carcinogens	NTP 1991

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE			
Regulations and Guidelines:			
a. Air:			
	Acceptable ambient air concentrations		NATICH 1996
	α-HCH		
Arizona	(1 hour)	1.10 μg/m^3	
Arizona	(24 hours)	3.00x10^{-1} μg/m3	
Arizona	(Annual)	8.10x10^{-4} μg/m^3	
Florida-Tampa	(8 hours)	5.00x10^{-3} mg/m^3	
Florida-Fort Lauderdale	(8 hours)	5.00x10^{-3} mg/m^3	
Florida-Pinellas	(Annual)	5.60x10^{-4} μg/m^3	
New York	(Annual)	1.67 μg/m^3	
Pennsylvania-Philadelphia	(Annual)	1.20 μg/m^3	
	β-HCH		
Arizona	(1 hour)	1.10 μg/m^3	
Arizona	(24 hours)	3.00x10^{-1} μg/m^3	
Arizona	(Annual)	8.10x10^{-4} μg/m^3	
Florida-Pinellas	(Annual)	1.90x10^{-3} μg/m^3	
	γ-HCH		
Arizona	(1 hour)	1.10 μg/m^3	
Arizona	(24 hours)	3.00x10^{-1} μg/m^3	
Arizona	(Annual)	8.10x10^{-4} μg/m^3	
Connecticut	(8 hours)	5.00 μg/m^3	
Florida-Tampa	(8 hours)	5.00x10^{-3} mg/m^3	
Florida-Fort Lauderdale	(8 hours)	5.00x10^{-3}mg/m^3	
Florida-Pinellas	(8 hours)	5.00 μg/m^3	
Florida-Pinellas	(24 hours)	1.20 μg/m^3	
Kansas	(Annual)	3.33x10^{-3} μg/m^3	
Massachusetts	(24 hours)	1.40x10^{-1} μg/m^3	
Massachusetts	(Annual)	3.00x10^{-3} μg/m^3	
Nevada	(8 hours)	1.20x10^{-2} mg/m^3	
North Dakota	(8 hours)	5.00x10^{-3} mg/m^3	
New York	(Annual)	1.67 μg/m^3	
Oklahoma	(24 hours)	5.00 μg/m^3	
Pennsylvania-Philadelphia	(Annual)	1.20 μg/m^3	
South Carolina	(24 hours)	5.00 μg/m^3	
Texas	(30 minutes)	5.00 μg/m^3	
Texas	(Annual)	5.00x10^{-1} μg/m^3	
Virginia	(24 hour)	8.30 μg/m^3	
Washington-Southwest	(24-hour)	1.60 μg/m^3	
	technical-HCH		
Arizona	(1 hour)	1.10 μg/m^3	
Arizona	(24 hours)	3.00x10^{-1} μg/m^3	
Arizona	(Annual)	8.10x10^{-4} μg/m^3	
Kentucky	Significant emission levels of toxic air pollutants	1.276x10^{-4} pounds per hour	NREPC 1986 (401 KAR 63.022)

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE (Cont.)			
Wisconsin	Hazardous air contaminant without acceptable ambient concentrations; lowest achievable emission rate	25 pounds/year[2]	WAC 1988
b. Water:			
	Drinking water quality criteria	0.0002 mg/L	
Alabama			AL DEM 1998
Colorado			CO DHWQD 1998
Connecticut			CT DEP 1998
Delaware			DE NREC 1998
Florida			FL DEP 1998
Georgia			GA DNR 1998
Idaho			ID DHW 1998
Illinois			IL EPA 1998
Indiana			IN OWM 1998
Iowa			IA DNR 1998
Kansas			KS DHE 1998
Kentucky			KY EPD 1998
Maine			ME DEP 1998
Maryland			MD DNR 1998
Massachusetts			MA DEP 1998
Michigan			MI DNR 1998
Minnesota			MN PCA 1998
Missouri			MO DNR 1998
Montana			MT DHES 1998
Nebraska			NE DEQ 1998
New Hampshire			NH DES 1998
New Mexico			NM ED 1998
Oklahoma			OK WRB 1998
Oregon			OR DEQ 1998
Rhode Island			RI DEM 1998
South Carolina			SC DHEC 1998
South Dakota			SD DENR 1998
Texas			TX NR 1998
Washington			WA DE 1998
West Virginia			WV DEP 1998
Wyoming			WY DEQ 1998
New York		0.004 mg/L	NY DEC 1998
North Dakota			ND DH 1998
	Surface water quality standards; aquatic life habitat		
Delaware	Acute	2.0 µg/L	DE NREC 1998
Delaware	Chronic	0.08 µg/L	
Hawaii	Acute	2.0 µg/L	HI CWB 1998
Hawaii	Chronic	0.08 µg/L	
Kentucky	Acute	2.0 µg/L	KY EPD 1998
Kentucky	Chronic	0.08 µg/L	
Louisiana	Acute	2.00 µg/L	LA DEQ 1998
Louisiana	Chronic	0.08 µg/L	
Maryland	Acute	2.0 µg/L	MD DNR 1998

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE (Cont.)			
Maryland	Chronic	0.08 µg/L	
Nevada		0.002 mg/L	NV DCNR 1998
New Jersey	Acute	2.0 µg/L	NJ DEP 1998
	Chronic	0.08 µg/L	
North Carolina		0.01 µg/L	NC DEHNR 1998
South Dakota	Acute	2.0 µg/L	SD DENR 1998
South Dakota	Chronic	0.08 µg/L	
Vermont	Acute	2.0 µg/L	VT ANR 1998
Vermont	Chronic	0.08 µg/L	
Wisconsin	Human threshold criteria		WDNR 1987
	α-HCH		
	Public water supply:		
	Warm water sport fish communities	0.07 µg/L	
	Cold water communities	0.033 µg/L	
	Great Lakes communities	0.034 µg/L	
	Non-water supply:		
	Warm water sport fish communities	0.15 µg/L	
	Cold water communities	0.045 µg/L	
	Warm water forage and limited forage fish communities and limited aquatic life	26 µg/L	
	β-HCH		
	Public water supply:		
	Warm water sport fish communities	0.12 µg/L	
	Cold water communities	0.059 µg/L	
	Great Lakes communities	0.06 µg/L	
	Non-water supply:		
	Warm water sport fish communities	0.027 µg/L	
	Cold water communities	0.079 µg/L	
	Warm water forage and limited forage fish communities and limited aquatic life	46 µg/L	
	γ-HCH		
	Public water supply:		
	Warm water sport fish communities	0.14 µg/L	
	Cold water communities	0.067 µg/L	
	Great Lakes communities	0.068 µg/L	
	Non-water supply:		
	Warm water sport fish communities	0.03 µg/L	
	Cold water communities	0.09 µg/L	
	Warm water forage and limited forage fish communities and limited aquatic life	53 µg/L	
	HCH-technical grade		
	Public water supply:		
	Warm water sport fish communities	0.094 µg/L	
	Cold water communities	0.044 µg/L	
	Great Lakes communities	0.045 µg/L	
	Non-water supply:		
	Warm water sport fish communities	0.02 µg/L	
	Cold water communities	0.06 µg/L	

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE (Cont.)			
Wisconsin	Warm water forage and limited forage fish communities and limited aquatic life	35 µg/L	
c. Other	Restricted use of pesticide. Special requirements on registration, permits, labeling, application, storage, disposal record keeping and/or reporting.		CELDS 1993
Alabama Arkansas Arizona California Colorado Connecticut Delaware Florida Georgia Hawaii Kansas Kentucky Illinois Iowa Maine Maryland Massachusetts Michigan Minnesota Missouri Montana Nevada New Hampshire New Jersey New Mexico New York North Carolina North Dakota Ohio Oklahoma Oregon Pennsylvania South Carolina South Dakota Utah Vermont Virginia Washington Wisconsin Wyoming			
Alabama	Groundwater protection; hazardous waste discharge	0.004 µg/L	CELDS 1993

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE (Cont.)			
California		0.004 µg/L	CELDS 1993
Colorado		Not specified	
Delaware		Not specified	
Kentucky		0.004 µg/L	
Louisiana		Not specified	
Massachusetts		0.004 µg/L	
Minnesota		Not specified	
Nebraska		0.004 µg/L	
New Jersey		0.004 µg/L	
New York		Not detectable	
North Carolina		0.004 µg/L	
North Dakota		Not specified	
Oregon		0.004 µg/L	
South Carolina		0.004 µg/L	
Tennessee		0.004 µg/L	
Texas		0.004 µg/L	
Utah		0.004 µg/L	
Wisconsin		0.001 mg/L	
Alabama Nebraska North Carolina Tennessee Vermont Virginia	Groundwater protection; EP toxicity	0.4 mg/L	CELDS 1993
Arizona Florida Missouri Nebraska Nevada Ohio Utah	Water quality criteria for agricultural use, recreation, wildlife and/or fish		CELDS 1993
Colorado Illinois Louisiana Massachusetts Minnesota North Dakota Vermont West Virginia	Hazardous waste criteria for lindane		CELDS 1993

TABLE 7-1. Regulations and Guidelines Applicable to Hexachlorocyclohexane (*continued*)

Agency	Description	Information	References
STATE (Cont.)			
Wisconsin			

[a]Group 2B: Possible human carcinogen
[b]Group B2: Probable human carcinogen
[c]Group C: Possible human carcinogen
[d]Group D: Not classifiable as to human carcinogenicity

ACGIH = American Conference of Governmental Industrial Hygienists; ADI = Acceptable Daily Intake; DOT = Department of Transportation; EPA = Environmental Protection Agency; FAO = Food and Agriculture Organization; FDA = Food and Drug Administration; HCH = Hexachlorocyclohexane; IARC = International Agency for Research on Cancer; MCL = Maximum Contaminant Level; MCLG = Maximum Contaminant Level Goal; NAS = National Academy of Science; ND = Not Determined; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; ODW = Office of Drinking Water; OERR = Office of Emergency and Remedial Response; OSHA = Occupational Safety and Health Administration; OSW = Office of Solid Wastes; OTS = Office of Toxic Substances; OWRS = Office of Water Regulations and Standards; PEL = Permissible Exposure Limit; REL = Recommended Exposure Limit; RfD = Reference dose; SDWA = Safe Drinking Water Act; SNARL = Suggested No Adverse Response Effect Level; TLV = Threshold Limit Value; TWA = Time Weighted Average; WHO = World Health Organization